Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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The ever-changing face of Combat Engagements

Flightfax

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U.S. ARMY SAFETY CENTER

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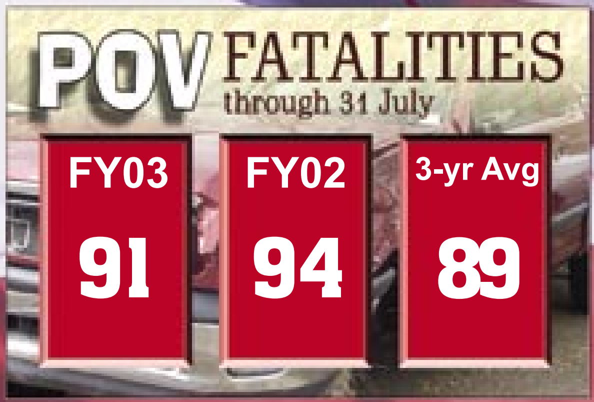

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Joe Smith

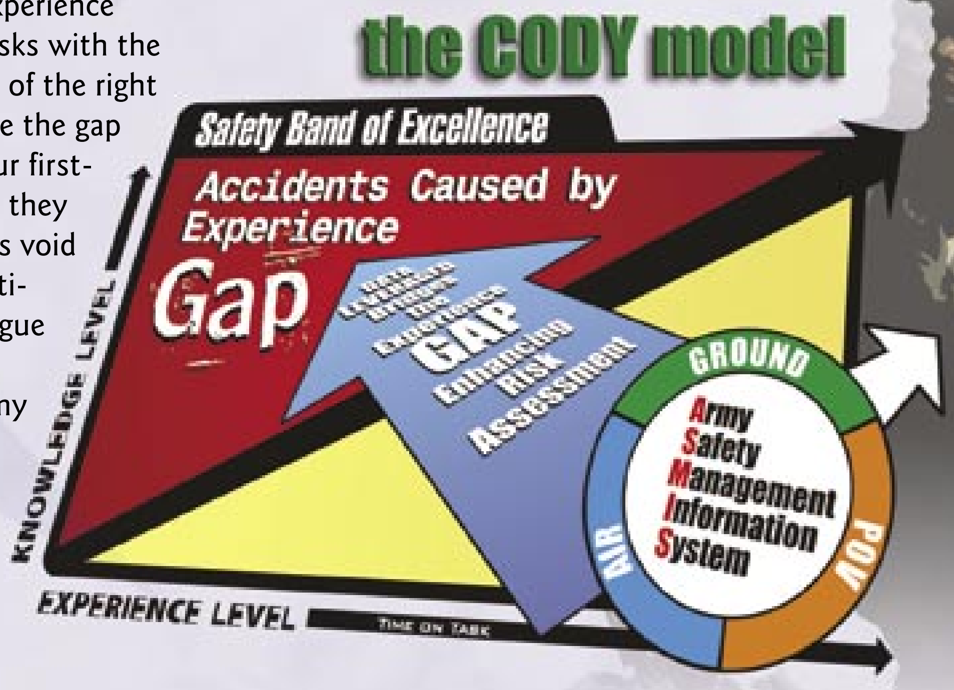
Joseph A. Smith
BG, USA
Commanding

Bridging the Gap Between Lack of Experience and Safety Excellence

As we approach the end of this fiscal year, the potential exists for the Army to experience its highest number of accident fatalities since 1994. The Secretary of Defense has laid out a clear challenge for us: **reduce the number of mishaps and accident rates by at least 50 percent in the next two years**. The key to achieving this goal lies in bridging the gap between lack of experience and safety excellence.

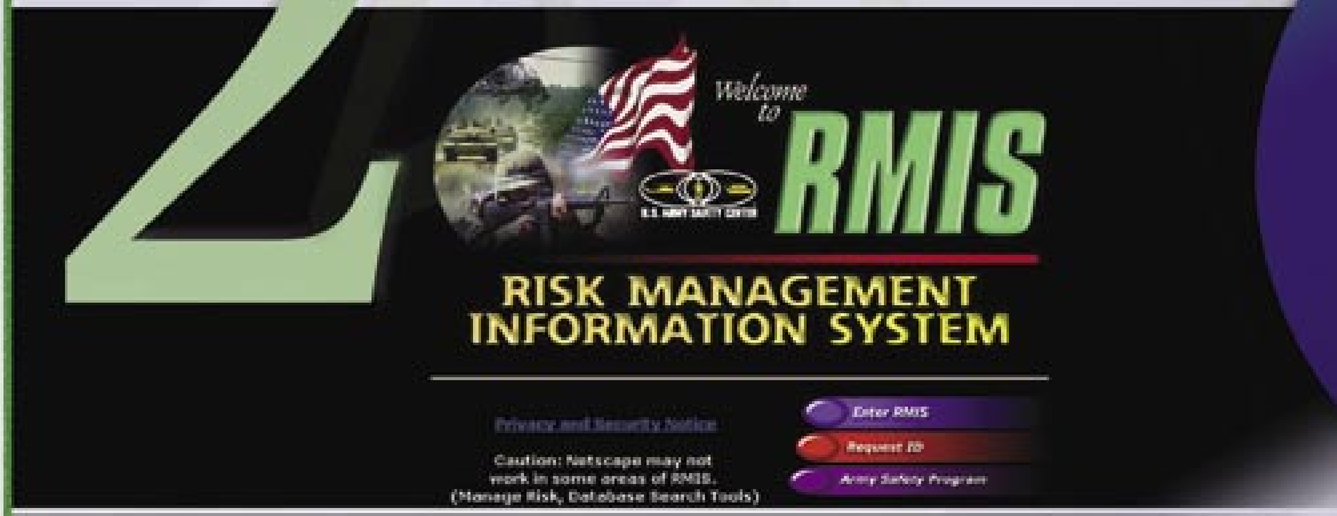
Recent deployments to Afghanistan and Iraq have taught me that accident fatalities are not normally the result of an inability to identify hazards. Risk is inherent in combat and realistic training, and our leadership generally identifies the appropriate hazards. However, we do not do as well identifying and implementing the right control measures to mitigate the risk of those hazards.

The cause stems not from negligence or a lack of effort, but rather from a lack of experience and knowledge. LTG Dick Cody, our Deputy Chief of Staff, G-3, asserts that our small-unit leaders and first-line supervisors simply lack the experience necessary to match the mission risks with the identification and implementation of the right control measures. We must bridge the gap between the experience level of our first-line leadership and the knowledge they need to properly mitigate risk. This void can be effectively filled by (1) multi-level leader involvement and dialogue and through (2) knowledge and information-sharing using the Army Safety Management Information System (ASMIS): a soon-to-be fielded web-based aviation, ground, and POV centralized risk-assessment program.



Risk Management "3 Deep" Leadership:

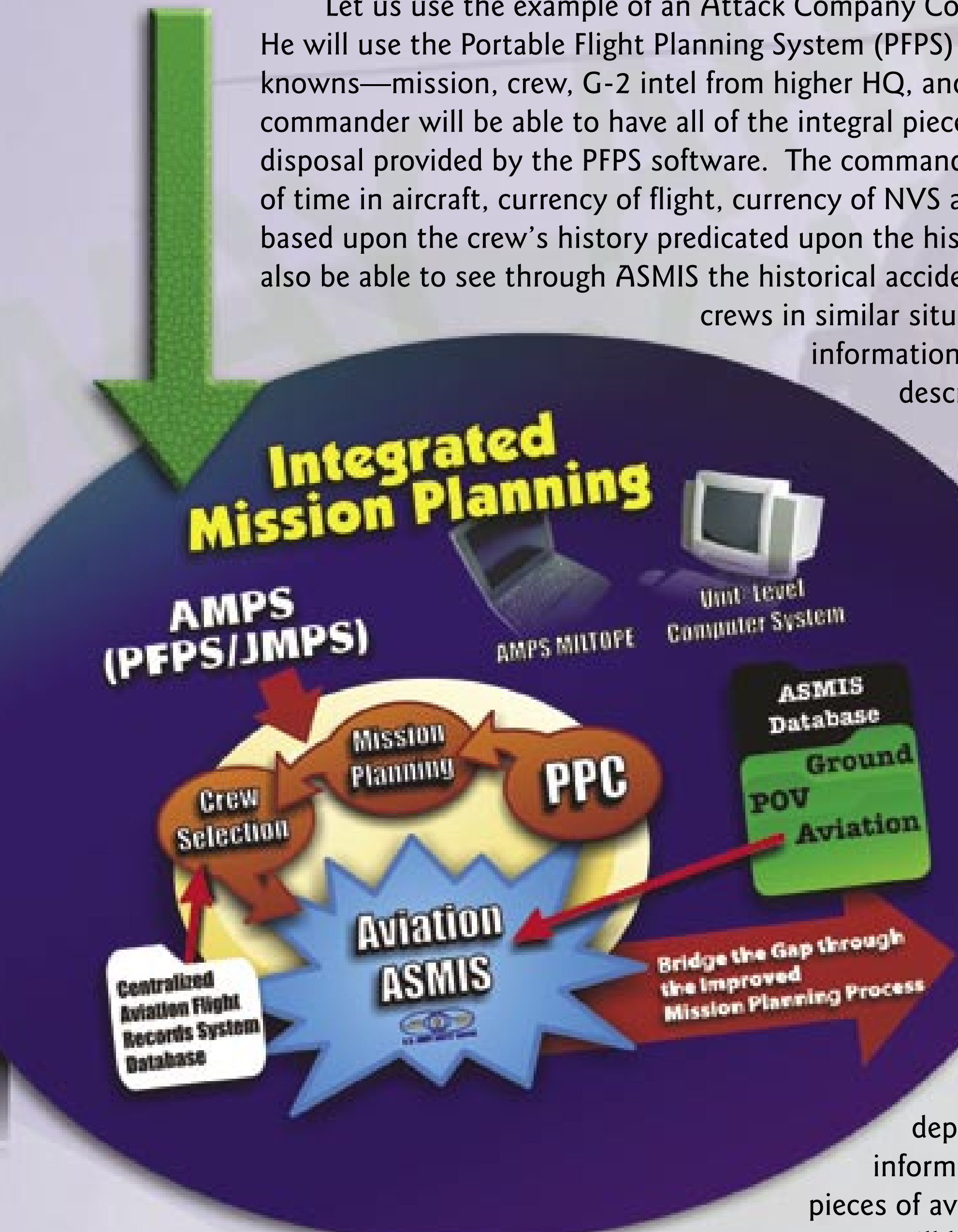
For every mission, on or off duty, there needs to be three levels of leader involvement. Using his knowledge of the individual soldier and guidance from higher levels, the first-line leader interacts face-to-face with each subordinate. The second-line leader supervises and spot checks, providing an independent set of eyes and the higher level of experience. The top-line leader uses his wealth of experience to provide guidance and supervises the risk-mitigation process to ensure the right control measures have been highlighted and implemented. This process of dialogue between leader levels gives less-experienced leaders knowledge in place of experience to protect their soldiers and move toward a safety band of excellence.



Information-Sharing Through Technology:

A second means of bridging the experience gap for first-time leaders is through information sharing that leverages technology. RMIS is our current web-based hazards, risks, and controls database that provides near real-time accident data. As we are transitioning to the next level, the Army Safety Center is working with Aviation Proponency in developing an automated risk assessment program that incorporates the data found in the RMIS database as well as other "stovepipe" systems to further assist leaders in identifying and implementing effective control measures. ASMIS will be an on-line, centralized risk-assessment program for air, ground, and POVs that will prompt mission leaders to input their demographics, mission type, and experience level. ASMIS will use the Army Safety Center databases to give our soldiers the degree of risk associated with the mission, the hazards, effective control measures, and examples of recent accidents that fit the mission profile.

Let us use the example of an Attack Company Commander who has 4 years time in grade. He will use the Portable Flight Planning System (PFPS) to plan his mission. By entering the knowns—mission, crew, G-2 intel from higher HQ, and Performance Planning Criteria—the commander will be able to have all of the integral pieces of the risk decision process at his disposal provided by the PFPS software. The commander will be able to see crew configuration of time in aircraft, currency of flight, currency of NVS and be able to make an astute decision based upon the crew's history predicated upon the historical data of ASMIS. The user will also be able to see through ASMIS the historical accident data of mistakes made by previous crews in similar situations of mission profile. All of this information will bridge the "knowledge gap" as described in the CODY MODEL and give that 4-year captain the leverage of 20 years of experience.



ASMIS will also provide senior leaders with the ability to identify and mitigate risks for upcoming deployments and combined arms exercises. This knowledge will allow them to develop the most effective home-station and environmental training to mitigate their unit's risk before departure. In the long-term, ASMIS can be integrated into all Army Mission Planning Systems. Wireless technology will allow leaders to obtain real-time information even on long deployments and field exercises. Eventually information on the failure rate of individual pieces of aviation and ground equipment and sub-components will be incorporated into the aviation and ground centralized risk assessment modules' database.

Using the hazards, risks, and controls information provided by the ground, aviation, or POV modules of ASMIS and supported by 3-deep dialogue between soldiers and their experienced leadership, our less-experienced leaders will have the knowledge to properly manage risk.

Keep your leader lights "on!"

Joe Smith

BG Joseph A. Smith

The ever-changing face of Combat Engagements

Army Aviation employment techniques have seen vast changes since the Vietnam War. The development of integrated air defenses and the Man-Portable Air Defense System (MANPADS) necessitated shifts in tactics, techniques, and procedures (TTPs), resulting in executing hovering engagements from nap-of-the-earth (NOE) altitudes. Target arrays changed considerably, and attack aviation transitioned from a close combat role to one of anti-armor in a European environment over open, rolling terrain.

Resultant TTPs focused on maneuver by stealth to concealed battle positions, limiting exposure during engagement with precision weapons that provided range overmatch. Teams would then disappear into the shadows to prepare for the next engagement. Aviators developed the skill of firing rockets from a hover, which presented new dynamics and coordination challenges. New aircraft were equipped with basic fire control computers that provided a fire control reticle for rocket engagements. Aviators began to maneuver the aircraft to a computer-generated "release point," as opposed to an out-the-window (via grease mark) aim point.

In the War on Terror, combat maneuver, maneuvering engagement TTPs, and the conduct of close combat with ground troops have appeared as critical mission requirements to support successful engagement of a distributed enemy in complex terrain. This mission requirement will remain valid for the foreseeable future. These TTPs do not replace NOE flight or hovering engagement, but must be taught in addition to those established concepts.

The foundation for combat maneuver and maneuvering engagement

Successful maneuvering engagement cannot be accomplished without a sound foundational understanding of the associated high-energy characteristics of a given platform. Aviators must maintain keen situational awareness of aircraft orientation, closure rate, and enemy disposition while adhering to aircraft envelope and platform limitations. Failure to manage any one of these facets can result in crew injury, aircraft damage, aircraft incident, and/or mission failure.

Just as NOE flight tasks and hovering engagements require key critical skills, high-energy maneuver must be built on essential knowledge and skills that have to be understood, applied, and correlated. The successful development of high-energy maneuver skills is predicated on instinctive understanding of the aerodynamics and characteristics that accompany the maneuvers associated with high-energy weapons platform employment. These aerodynamics and characteristics include transient torque, total lift area loss due to blade coning (i.e., mushing), conservation of angular momentum, high angle turn factors, g-loading, and associated total aerodynamic force effects. While these descriptions require more room than allotted in this article, aviators should give the "maneuvering flight rules of thumb" ample consideration during mission planning and execution.

Maneuvering flight rules of thumb

1. Never move the cyclic faster than you can maintain trim, rotor, and torque. If you enter a maneuver and the trim, rotor, or torque reacts more quickly than you anticipated, then you have exceeded your own limitations. If you continue on this path, you most likely will exceed an aircraft limitation. Slow down and perform the maneuver with less intensity until you can control all aspects of the machine.

2. Anticipate changes in aircraft performance due to loading or environmental condition. The normal collective increase to check rotor at sea level/standard will not be sufficient at 4,000 feet and 95°F.

3. Anticipate the following characteristics (for American conventional and non-tandem rotor helicopters) during maneuvering flight and adjust or lead with collective, as necessary, to maintain trim and torque:

- During aggressive left turns, torque increases.
- During aggressive right turns, torque decreases.
- During aggressive application of aft cyclic, torque decreases and rotor climbs.
- During aggressive application of forward cyclic (especially immediately following aft cyclic application), torque increases.

4. Always leave yourself a way out. Regardless of the threat, the ground will always win a meeting engagement.

5. Know the wind direction and approximate speed.

6. Most engine malfunctions occur during power changes.

7. If you haven't performed combat maneuvers in a while, start slowly. Much like night vision device (NVD) flying, your cross-check slows and it will take some time to develop proficiency at tasks that have not been performed for extended periods of time.

8. Crew coordination is critical. Everyone needs to be fully aware of what is going on, and each crewmember has a specific duty.

9. In steep turns the nose will drop. If this drop is not compensated for, a sink rate will develop. In most cases you must trade energy (airspeed) to maintain altitude, as you will not have the required additional power (e.g., to maintain airspeed in a 2-g and 60-degree turn, you will have to increase rotor thrust and engine power by 100 percent). Failure to anticipate this at low altitude will endanger yourself, your crew, and your passengers. The rate of pitch change and sink rate will be proportional to gross weight, density altitude (DA), and angle of bank.

10. Many maneuvering flight overtorques occur as the aircraft unloads g's. This is due to insufficient collective reduction following an increase to maintain consistent torque and rotor speed as g-loading increases (i.e., dive recovery or recovery from a high-g turn to the right).

Critical combat maneuver do's and dont's

1. Employ combat maneuver as a function of mission requirement, not recreational activity. Every aviator that employs these techniques at the wrong place and time endangers our ability to continue this critical training.

2. Train only those maneuvers that have a combat application. These platforms are made to engage and destroy the enemy and are not purchased to enable you to impress friends, relatives, or passengers. Again, one incident will endanger your fellow aviators by denying them training.

3. Taking unnecessary risks when carrying a load of combat-equipped infantry soldiers can be equated to a commercial airline pilot showing off when carrying athletes to the Olympics. There is no excuse. Do what the mission requires.

High, heavy, and hot environments

A thorough understanding of the three components of energy (altitude, airspeed, and engine power) and its tradeoffs must be ingrained. All of these factors must be nested in an overarching understanding of the effects of aircraft weight, temperature, and altitude. Weight, temperature, and altitude substantially affect helicopter performance. While this seems a bold statement of the obvious, crews that habitually fly lightly loaded platforms in a cool, low altitude environment repeatedly are surprised when deployed to a high, hot theatre of operations. Aircraft must be flown differently as power margins shrink due to DA and aircraft loading. The following rules of thumb for high, heavy, and hot environments have served many aviators well.

High, heavy, and hot rules of thumb

1. Always land or take off INTO THE WIND. It sounds incredibly basic, but we don't always do it.

2. If at all possible, maintain effective translational lift (ETL) until within ground effect.

3. When out-of-ground effect (OGE) power is close to maximum power available, there is a very limited ability to arrest descent when hovering or flying at speeds well below ETL. For example, in an AH-64A, if your OGE hover power is 92 percent and your maximum torque available is 98 percent, you have roughly enough power margin to establish a 300 foot per minute (fpm) vertical climb while at a hover. This means that if you allow a sink rate of more than 300 fpm to develop, you will not be able to recover without building airspeed to above ETL and trading energy. This will take a lot of altitude to accomplish.

4. If you must approach to an OGE hover, be keenly aware not to allow a sink rate to develop (see rule 3). Execute the deceleration slowly. A large flare is conducive to a sink rate you might not be able to arrest.

5. When margins are close, avoid left turns until above ETL. Substantial left pedal inputs could very well overtorque or droop the rotor when operating near the limits.

6. When operating near the margins, do not forget the option to jettison the stores or load. This should be an integral part of the brief.

7. High DAs, hot ambient temperatures, or a heavy helicopter will require more altitude to recover from dive pull-outs or breaking turns and less engine or rotor capability to recover with.

8. Know your aircraft's limits and power margins before you leave the ground. Performance planning is not conducted to check a block. When computed correctly, it provides critical information to enable mission accomplishment and sound cockpit decision-making.

9. When conducting multiple aircraft operations, do not conduct the takeoff in trail formation. The downwash created by the aircraft to your front might exceed your power margin during takeoff. When possible, takeoff individually and conduct an inflight link-up.

10. While nearly all aviators have been through academics on retreating blade stall and frequently describe it during annual evaluations, most rarely experience it. During missions with a heavy aircraft in a high, hot environment, the onset of retreating blade stall occurs sooner (a good hint is when you notice a reduced velocity not to exceed [VNE] during performance planning card [PPC] computation). Review and know the causes, the onset characteristics for your aircraft, and recovery methods before any deployment to a high, hot environment. Good information can be found in Field Manual (FM) 1-203, *Fundamentals of Flight*, on pages 6-39 through 6-43.

Perceptions

Overarching vigilance must remain high in identifying the high-risk aviator. Aviators that perform unauthorized maneuvers with no combat application must be held accountable. This vigilance, however, must be focused. There have been numerous crews that have returned from a flight that involved authorized training, performed within the constraints of the aircrew training manual (ATM) and operator's manual, only to be told to report to the company or battalion commander to answer reports of inappropriate use of Army aircraft. An education process must take place to inform those in our branch and in our Army of what training must be integrated in order to ensure mission success in today's demanding environments.

The path ahead

U.S. Army Aviation Center (USAAVNC) leadership has directed development of the path to provide the substance, framework, and requisite training for maneuvering flight engagement and associated considerations for operations with heavy aircraft in high, hot environments. The time has come where training is pushed to the mainstream and not conducted in isolation by instructors who honestly endeavor to accomplish what their conscience decrees as the right thing. The key objective is to provide the line aviator with the skills and knowledge to accomplish the mission aggressively, effectively, and safely in a rapidly changing environment.

This initiative includes adjustments to USAAVNC Plans of Instruction (POIs), additional instruction during aircraft transition, the development of ATM tasks, train-the-trainer visits by the Directorate of Evaluation and Standards (DES), and the generation of a "maneuvering flight handbook" similar to a pilot's pocket tactical standing operating procedure (TACSOP). In the meantime, know the capabilities of your platform, operate within established limitations, listen to your instructors, apply common sense, and anticipate aircraft response. Take these steps to subject the enemy to violence and maneuver, and GO GET SOME. ♦

—POCs: This information was jointly prepared by the following individuals—
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Attack Aviation in Restricted Terrain

"**Know yourself, know the enemy, but always analyze and apply the effects of terrain**." These are seemingly simple-enough terms for the professional warrior. However, knowledge of the terrain and the effects it can have on military operations is a skill that increasingly is becoming clouded by modernization. This article invokes some thoughts on the proper use of attack aviation in restricted terrain, using the Korean peninsula as a template.

While Field Manual (FM) 1-112, *Attack Aviation Helicopter Battalion*, includes mission, enemy, terrain, troops, and time available (METT-T) in all of its tactics, techniques, and procedures (TTPs), it primarily focuses on open terrain with little relief. Korea, which is punctuated with rough mountains, large streams, and rugged narrow passes with about only 20 percent of the peninsula suitable for cultivation, quickly brings renewed emphasis for understanding METT-T. The Korean Peninsula comprises numerous ridgelines and hills that offer excellent cover from direct fire and ground observation. Restricted terrain affords attack aviation little chance for success unless it is controlled and employed properly. The proper use of command relationships, attack reconnaissance, and battlefield synergism can mean the difference between mission accomplishment and mission failure.

In Korea, the 2d Infantry Division has one aviation brigade with one assigned AH-64 attack helicopter battalion. The operational control (OPCON) of this extremely lethal asset usually is accompanied by the same unintended restrictions: "Don't piecemeal Apaches" and "husband the resource." Unfortunately ground commanders, as well as attack helicopter commanders, adhere to these restrictions a bit too literally. A division commander would operationally control an attack battalion to a ground maneuver brigade only after careful consideration and analysis. The division commander might need to improve the correlation of forces (COFMs) ratio, but realizes the ground commander who owns the terrain is the most suitable agent to coordinate the attack of ground and air assets. He may visualize that the ground commander needs the unique capabilities of the AH-64—unrestricted maneuver and night visionics with magnification—to conduct reconnaissance or a pre-emptive strike to desynchronize the enemy. The division commander could even operationally control them to the ground commander in a "911" situation where ground forces are taking heavy casualties due to an unsuccessful breaching operation. Korean terrain offers the division commander many possibilities for the OPCON of attack assets.

Korea's many defiles make the AH-64's unique capabilities a primary asset to ensure force protection in the close fight. However, the ground force commander seldom will be able to employ a complete Apache battalion en mass in this type of terrain. He might employ AH-64s in small lead-wingman teams, or he could use the entire battalion in the one-third rule. Apache lead-wingman teams flying some 3 to 5 kilometers ahead of ground scouts can be employed at night to find the enemy and alert ground forces to ambushes, disposition, etc. This still would leave the ground commander sufficient combat power in the attack battalion to execute typical missions such as destroy the counterattack force or reserve.

Unfortunately, this type of employment poses a quandary. Doctrinally, an attack battalion can be operationally controlled to no lower than a ground maneuver brigade. However, tactics dictate that the ground commander in contact is the best agent to control or integrate Apache fires into the fight (to preclude fratricide) and to take measures to synchronize direct and indirect fires. The maneuver brigade commander should control the asset for planning but, during employment and execution, the AH-64s must talk and work specifically with the ground force commander, regardless of the size of that force. Moreover, the brigade commander must ensure that the attack and ground force commanders are executing within his intent. This concept is not new and has been employed successfully by special operations aviation on numerous real-world missions to facilitate command and control, increase lethality, and prevent fratricide.

In deep operations, commanders caution against "trolling for tanks" and appropriately allow Apaches very little flexibility to maneuver beyond the assigned engagement area and designated routes. If the attack battalion is told to attack the reserve in Engagement Area (EA) Stuart in support of the maneuver brigade, then we expect the reserve to be on the move long enough for us to detect, identify, and track the enemy formation. Unfortunately, Korean terrain negates this detection usually by providing the enemy reserve a covered and concealed route to the engagement area. The enemy reserve might have to move, in a typical scenario, only 2,500 meters, hardly enough distance to detect, identify, and track. A more viable mission is to orient the attack helicopters on the enemy force. A moving enemy reserve normally would not have time to make defensive preparations or to have a robust air defense artillery (ADA) threat, allowing AH-64s to discover the formation even in daylight from standoff range. This type of mission allows attack aviation to fully negate and exploit the advantages that restricted terrain provides to the enemy.

Battlefield synergism might not necessarily mean simultaneous synchronization. A National Training Center (NTC)-like environment forces the ground commander to synchronize his total combat power in one or two engagement areas—simultaneous engagements to destroy the enemy en mass. However, simultaneous synchronization in restricted terrain is extremely difficult to control and very vulnerable to fratricide. A far better plan is to destroy the enemy reserve as a pre-emptive measure, since the reserve probably is not dug in and would not have to move any appreciable distance to enter the intended engagement area. In essence, the AH-64s would find and destroy the reserve as the enemy's main body crossed the line of departure (LD) and was engaged by direct-fire weapons systems. The synergistic effect of this operation is that the enemy would have to deal simultaneously with a close fight and operations in his rear.

Adjusting command relationships, modulating attack reconnaissance, and sequencing synchronization might not be suitable for desert operations or doctrinally correct by our manuals, but they are extremely effective in desynchronizing the enemy in restricted terrain. The old adage that the only good tactic is the one that works is reinforced quickly by the restricted terrain on the Korean peninsula, where METT-T analysis can mean the difference between victory and defeat. ♦

—Reprinted with permission from the Center for Army Lessons Learned (CALL) Web site, http://call.army.mil/call.htm. Major Bob Werthman wrote this article while he was stationed at 2ID, Korea.

Things That Go Bump in the Flight

Ian MacPherson
Royal New Zealand Air Force

Joining the Royal New Zealand Air Force in 1988 was the realization of a dream for me. I had earned my private pilot's license a few years earlier, and I found the discipline, high standards, and relentless emergency training somewhat of a shock. Looking back, I believe this training saved my life and the lives of all those on board a UH-1 when its tail rotor failed and I was pilot.

With only 301.4 hours in the Huey, I was a junior bograt and seldom authorized as captain. Generally, the tasks the squadron flew required the better-qualified pilots to occupy the right seat. However, to get experience, we occasionally were sent out on day navigation exercises, as was the case on this particular day.

As Number Two in the formation, we were positioning downwind left-hand for Runway 03 at the local airfield. The rejoin was briefed to be a run-in, low-level on Runway 03, followed by a 1-second, 270-degree right break to terminate outside the Number 4 hangar. All was going as planned except for Number One's VHF radio, which had failed just minutes before. In their place, my crew was doing all the joining calls for the formation.

In mid-downwind and only 1½ miles from the airfield, we felt and heard a high frequency vibration throughout the airframe. It's funny how often you hear, feel, or smell something in the cockpit but, after consultation with the crew, the problem appears to have been a figment of your imagination. In the hope that this was perhaps one of those times, I sheepishly asked the question, "Can you guys hear or feel that?" Over the intercom my crewmembers replied, "Sure can." There was little doubt in our minds that, with the airfield so close, we should turn left, leave the formation, and land as soon as possible.

Once clear of the other aircraft and with the whole airfield in our sights, we had about a minute to address the issue; strangely, though, the vibration had gone away. All the flight controls were responding normally, and all the instruments were normal. Since the noise had gone and everything appeared to be okay, I felt no cause for alarm. My copilot had his hands full operating two radios, and I don't think he particularly was worried either. Why should he? After all, the noise was gone.

As we crossed the perimeter fence, the Number Four hangar came into sight. I felt a slight sense of relief: Home was now only 300 yards away. However, we were far from out of the woods. As the Huey approached translational, I introduced collective to arrest the rate of descent. When I did, the aircraft made a sudden and violent yaw to the right. I never had seen or experienced anything like this in all the training I had received.

One thing did seem obvious—pulling up the collective had caused this immediate problem, so the sensible act was to put it back down. I did this and, fortunately, the rotation stopped at about 110 degrees. Then the nose came left again to settle at 60 to 70 degrees out to the right. It came as no great surprise that the vibration was back and with far more vengeance than before. Some height and speed were lost, but we still were crossing the ground at approximately 20 knots and descending at about 40 feet.

Acting on instinct, I tried to introduce power and increase airspeed. The aircraft responded, but continued flying at an alarming attitude: The left skid was very low, and the nose was wavering between 70 and 90 degrees to the right. Despite reducing the rate of descent (thereby delaying impact with the ground), efforts to climb proved fruitless as the aircraft threatened to rotate through 90 degrees every time power was increased beyond a critical point. My copilot and crewman automatically performed the critical actions of a mayday call and secured the passengers in their crash positions.

The point of impact was quite obvious at about 100 yards away. As the aircraft approached 10 feet, still crossing the ground at about 20 knots, I had no choice but to treat this as a low-power tail rotor emergency. For a helicopter like the Huey, which has a counter-clockwise rotating main rotor, a low-power tail rotor emergency means the tail rotor is not producing the thrust required for a given power setting and, as power is introduced and/or airspeed is reduced, the nose rotates to the right. The only corrective measure is to close the throttle, which eliminates torque; the nose then rotates left for a matter of seconds, during which time the aircraft should be run on while the skids are aligned with the direction of travel.

As the Huey approached translational, I introduced collective to arrest the rate of descent. When I did, the aircraft made a sudden and violent yaw to the right. I never had seen or experienced anything like this in all the training I had received.

During training we would never practice such an extreme low-power scenario. I had not seen this maneuver performed with the nose beyond 20 to 30 degrees to the right. I briefed the crew of my intention to close the throttle to flight idle and proceeded to do so. The aircraft yawed to the left but didn't quite reach the direction of travel. Suddenly the rotation reversed, and the nose was rotating to the right again. Now we really were committed—rotor rpm was reducing rapidly, and the rotation was accelerating through 90 degrees to the right.

Instinct took over again and I attempted to reduce ground speed to zero, for the aircraft surely would turn over if we hit with any sideways movement. The left toe kissed the ground but didn't grab it, allowing 15 more feet of flight before contacting it again, only this time harder. As the skid tore into the soft topsoil, the remaining sideways movement caused the aircraft to rear up on its left skid, all the time rotating to the right. The last of the energy was dispelled as the left heel also penetrated the topsoil. The aircraft, now completely out of control, threatened to roll over.

Fortunately, the dynamic rollover effect stopped before the center of gravity exceeded the limit of the left skid. The aircraft ungracefully fell back down and for the first time contacted the ground with both skids. It was now facing 180 degrees opposite of the approach heading.
The crewman quickly exited the aircraft to check for the cause of this hair-raising ride. The copilot and I looked anxiously at each other while we secured the engine and turned the electronics off. The main rotor still was winding down when the crewman returned and said the tail rotor was not turning at all. He could see the failed tail rotor drive hanger bearing. This was the first time during this 50-second ordeal that any of us could think clearly enough to acknowledge the fault and its seriousness.

I flew the Huey for 5½ more years and eventually qualified as both a fixed- and rotary-wing instructor. I now have a total of 2,500 flying hours, of which 1,800 are on helicopters. I never have forgotten the time my tail rotor failed, and I doubt I ever will. Surprisingly, I don't think I would do anything different if it happened again. Perhaps I wouldn't have flown a normal approach but, again, the noise was gone and there were no signs of a serious problem.
After all, how often do you hear a noise that turns out to be nothing?

I attribute our instinctive handling of this problem to the excellent instruction I received during my training. To put it in simple terms, when you fly helicopters there are some things that have to be instinctive. The initial actions required when you lose yaw control or tail rotor effectiveness is an example of one of these times. You've been trained by the best. Use that training to keep you and your crew safe! ♦

—This article was written by Royal New Zealand Air Force (RNZAF) squadron leader, Ian MacPherson. You can read this true account and many others in Greg Whyte's book entitled, "Fatal Traps for Helicopter Pilots" recently published in August 2003 in New Zealand. You can preview and order the book at http://www.fataltraps.com. For more info, contact Greg Whyte, P.O. Box 75, Waikato Mail Centre, Hamilton 2015 New Zealand, Fax: +64-7-850-6053 or e-mail: greg@fataltraps.com.

A Warm Tent and a Cup Full of Soup

LTC Joseph McKeon
U.S. Army Safety Center

As I write this article, it's July and I'm in southeastern Alabama—hot, hot, hot! But given the literary flash-to-bang time between writing an article and getting it into the bathroom stall where it can be read by soldiers, it's already time to think about winter. It's also the 50th anniversary of the declared cease-fire in Korea, which was a welcome relief to all those dog-faced Joe's who suffered through brutal Korean winters.

Looking back at World War II and Korea, the numbers of soldiers incapacitated due to cold weather injuries was staggering. LTC (Dr.) Kenneth Orr reported in 1954 that the number of hospitalization days due to cold injuries in those two conflicts was more than 3 million! Imagine our entire Army being hospitalized for more than a week. This stands as a stark reminder of how poorly trained and equipped soldiers rapidly can become compromised, especially in the absence of meticulous supervision by caring leaders.

As a soldier today, you are neither poorly trained nor poorly equipped, nor are you lacking caring leaders. So why bother writing about cold injuries? Because they continue to happen, even though they are preventable. The equipment issued to you, when used and maintained properly, will allow you to fight and win in even the most austere environment.

I know this because when I was building my little shelter in the snow near Fairbanks, AK, it was 20 degrees below zero and my gear protected me. And then there was the time I spent the night unexpectedly on a hilltop at the National Training Center (NTC), CA. I was with a light infantry battalion and had nothing but the BDUs I was wearing and my TA-50. Even though the temperature was "only" in the 40s, I endured the coldest night of my life. But this article isn't about "war stories;" rather, it's about protecting yourself and the soldiers you work with.

As individuals and leaders, it is your responsibility to ensure your soldiers are trained and equipped properly. That means anticipating being colder and staying longer than originally planned. Those who grew up in cold environments have learned how to respect the weather and dress for it. Few residents of Fairbanks or Watertown, NY, would walk out to the mailbox in a T-shirt and shorts in February or drive to the store without a coat and gloves in the car. If the door accidentally locked behind you or the car broke down, you could freeze to death. So what was I thinking, ending up with my "hooah" medical team stuck on a hilltop at NTC with no "snivel gear?" The fact is, I WASN'T thinking, and I set us up for cold injuries. Life is too short to make all the mistakes yourself, so learn from others! Don't be the one who endures a night freezing in the back of a "Hook" or a "Hawk" because you didn't bring your cold weather gear, or didn't take your coat out to the Apache because it was "only a quick test flight."

When considering injury prevention, it often pays to target your efforts at the highest risk group. So what does the "typical" cold injury patient look like? He (I'm not using your usual sexist male pronoun, it's just that the typical cold injury victim is male) is young, usually about 20; is from a warm climate (he hasn't learned you don't walk to your mailbox in February in a T-shirt); has less than 18 months in the service (so it's his first winter field training exercise); and he's neglected his foot care. In the infantry, foot care is a leadership issue, and the rest of the Army needs to get with the program! In addition, he is likely to use alcohol, tobacco, and possibly medications. While flight personnel know better than to self-medicate, other soldiers in the unit might not. Look around your squad, platoon, company, battery, or troop and see if you have soldiers that fit the above description, because they are at risk. Identify them and pay special attention to them now, before you go to the field or deploy.

Now that we have an idea of who is most likely to get hurt, let's briefly discuss cold injuries and what we can do to prevent them. The human body is indeed "fearfully and wonderfully made." I'm sure you've noticed how some folks get very "red in the face" when they exercise. That's the body's cooling mechanism shunting blood to your skin so the blood can be cooled readily. But did you know the shunting process also works the opposite way? In cold environments, as much as 99 percent of surface blood flow can be shifted back inside you to keep your vital organs warm. Amazing, isn't it?

However, this protective mechanism that has been "engineered" into our bodies can be defeated by what we do. For instance, dehydration decreases the amount of blood that is circulating, thus hindering the body's heating mechanisms. That's why it's so important to ensure we stay hydrated. Pushing fluids can be forgotten in a cold environment. This is especially true if you have to get out of a warm tent when it's below zero, trudge through the snow, and "drop trou" to pass water, or if you've got to walk a quarter mile from the aircraft to latrine facilities.

In cold weather you might be tempted to drink less to reduce your need to leave your nice, warm tent. However, this can set you up for dehydration and even a heat injury—that's right, a heat injury! When you are performing hard physical work in a cold environment and wearing all your protective equipment, it's easy for you to start sweating and become overheated. You can end up exhausted and sweaty, and then cool off rapidly in the cold. It's no wonder the typical cold injury victim is a young, first-term male soldier...who usually gets detailed to put up the GP Mediums!

In addition to the demographics listed above (young, first-term males), there are other significant risk factors. If you have a previous history of cold injuries you are obviously at risk, because you've already shown that you are susceptible. In addition, if you are not physically fit, you are more likely to be injured—thus the Army's emphasis on physical fitness.

Poor or inadequate nutrition also can take its toll quickly. When you're in a cold environment, your body has a greater metabolic demand because you're burning more calories trying to stay warm. If you need 3,000 calories per day in a controlled environment, you may need up to 4,500 calories in a cold environment just to maintain your body weight. Eating meals also will increase water consumption, which will be a hedge against dehydration.

Too little activity also can be a risk factor. While overheating is a risk when you are working hard, lack of activity can cause you to have cold injuries because of poor circulation in the extremities. Using those large muscle groups will ensure good circulation and heating, so get up and do 20 side-straddle hops (when not in contact with the enemy!).

Alcohol and tobacco, as well as caffeine, also can make it harder for you to stay warm. These substances all affect your body's ability to dilate (widen) and constrict the blood vessels, which can defeat your body's built-in heating and cooling mechanisms. Prescription and over-the-counter medications can adversely affect your body's heating and cooling as well, so it is important to let your doctor know if you will be exposed to cold weather. If you are a leader, you need to create a healthy work environment where soldiers are steered away from unwholesome behaviors such as tobacco use and excessive alcohol consumption.

Okay, let's wrap this up, so to speak, with some tips on prevention. Dress in layers and avoid tight-fitting clothing. This will improve your circulation and provide layers of air between layers of clothing to help insulate you. Change your socks frequently to ensure your feet stay dry. This is going to require that you actually take off your boots and socks and change the latter, maybe even the former. If you are a squad leader, you might have to closely observe your soldiers to ensure compliance.

Beware of the wind. Wind chill can cause skin to freeze at temperatures that would be much less dangerous in the absence of wind. This is especially important when you are working around helicopters or in open areas where trees or man-made features are not available for wind protection. Just the other day I heard a CH-47 set off car alarms in a parking lot at Fort Rucker. Now that bad boy can put out some wind! Ensure your soldiers and passengers do not linger in rotor wash in below-freezing temperatures. Protect your face and ears, because these areas often suffer frostbite due to exposure and decreased blood flow. Wear the appropriate gloves, especially when you're handling petroleum, oil, and lubricants (POL) products, and avoid touching cold metal or fuel. Change wet gloves and clothing immediately, especially if fuel is spilled. In addition to the fire hazard, evaporating fuel can speed the onset of cold injury. Eat often and drink warm, non-caffeinated beverages. Soup is super, and remember to wash your hands!

Use the buddy system. Seek medical attention for yourself and your buddy before symptoms become severe. As cold skin gets numb, subtle damage can progress and become a severe injury. Don't be like those thousands of soldiers that spent weeks convalescing during World War II and Korea. This Army needs every soldier every day, so take care of your body. After all, where else are you going to live? ♦

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Basic Instinct

CW3 Joseph E. Gould
ASOC 03-003

It had been almost 40 days since our last night vision goggle (NVG) flight. Mark and I had been battle-rostered together for almost the entire past year in a UH-60L assault battalion as our company's primary flight leads. It was definitely time to brush up on our skills, so we planned a night training flight and put the same effort into it as we would the real thing.

The next evening we flew the planned mission. We were both pleased with how the flight went and decided to head back to the airfield. On the way back, I asked Mark if he minded doing some emergency procedure training at the airfield when we returned. I put the extra training on the brief sheet because I knew we would have fuel left after flying our route, and I wanted to get as much training as possible out of the evening. Part of the reason we hadn't flown for almost 40 days was because the flying-hour budget had been spent. Mark said, "That sounds like a good idea to me." He asked me what I had in mind, and we agreed on roll-on landings.

After I finished my third roll-on landing, Mark started to rib me on my technique in the use of aerodynamic braking during the maneuver to help in bringing the aircraft to a stop. I was taught to use this method to prepare yourself for the fact that if you lose one engine, you might not be afforded the luxury of an airstrip on which to land the aircraft. Mark was the pilot in command (PC) and had almost twice the flight experience I had. I completely respected his experience and his desire to teach me new or better ways to do things, whether it was in cockpit management or a roll-on landing. After taking his jokes for a while I said, "Alright, Hot Shot, show me how it's done."

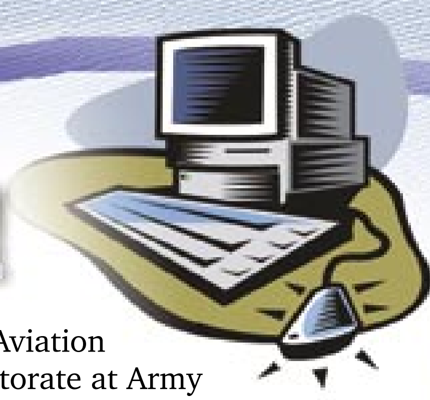
On downwind we were talking about his roll-on landing philosophy—you wouldn't have the power available to use any form of aerodynamic braking, and you should rely on the brakes to stop the aircraft instead. We turned base and tower gave us permission to perform the roll-on, with a mid-field hold restriction because of the amount of traffic in the pattern. I thought to myself, "Perfect, he's in a situation that I had always trained for and his technique didn't allow for." (I say he was in a situation because he was on the controls.) When we turned final, tower lifted the restriction and cleared us for the entire runway. "He's lucky," I thought to myself again. Mark had everything set up for the perfect roll-on landing.

Our tail wheel just came into contact with the runway when the tower came back with the mid-field hold restriction. All I felt was the cyclic come back hard, with no collective being applied. Flashing before my eyes was the –10 warning that talks about the stabilator being programmed down and 25 degrees pitch attitude, which can cause the stabilator trailing edge to contact the ground. Our crew chief announced we had sparks coming from the back of the aircraft. I knew what had happened. We went into parking and shut down.

The reason I am sharing this story is because, as aviators, we always are being warned about being overconfident in our own ability. In this instance, I was overconfident in the other pilot's ability, and maybe a little under confident in my own. I saw everything happening and knew what was wrong, but I did nothing because I believed too strongly in Mark's ability to control the aircraft. Yes, he was the PC, but together we were a crew. If I had allowed myself to act upon my instinct, I could have prevented this accident. ♦

—CW3 Joseph E. Gould wrote this story while attending the Aviation Safety Officer Course, ASOC 03-003, U.S. Army Aviation Center, Fort Rucker, AL. He is currently assigned as an aviation maintenance officer to the 2/409th Training Support Battalion, Knoxville, TN. CW3 Gould may be contacted by e-mailing joseph.gould@us.army.mil.

We Need Your Help!



The Army Safety Center, in conjunction with Aviation Proponency and Software Engineering Directorate at Army Armament, Munitions, and Chemical Command (AMCOM), are developing an automated risk management tool to be integrated into the redesigned aviation mission planning system (AMPS); i.e., PFPS and JMPS. We are currently soliciting ideas from the field. Your input is valuable for the development of a risk management tool that is useful and user-friendly. Basically, what we are asking: If you could design an automated risk management tool, what would you like to see? Any good risk assessment worksheets, hazards, and associated controls for particular missions, ideas, etc., are encouraged. Send all inputs to **AutoTool@safetycenter.army.mil**.

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class C:** The #1 engine generator caught fire during cruise flight. The aircraft landed hard in rough terrain. The onboard fire subsequently was extinguished.

■ **Class C:** While landing from a 10-foot hover, both crewmembers heard a loud "clunking" noise, followed by another series of noises. The noises immediately were followed by the MASTER CAUTION light and the FIRE APU (auxiliary power unit) warning light illuminating. While calling another aircraft in their flight to check for signs of fire, the crew smelled smoke. By this time the aircraft was on the ground, and the pilot in command (PC) executed the emergency procedure for APU FIRE and announced, "Get out." The crew egressed unassisted and without further incident. The APU was replaced, and the aircraft was released for flight.

■ **Class C:** Before takeoff, the crew completed a health indicator test (HIT) check. The crew felt rushed to meet the takeoff time and did not complete a before takeoff check. The #1 power lever was left in the IDLE position and, as the PC picked the aircraft up to a hover, the rotor drooped and the generators drooped offline. The PC landed the aircraft and determined the #1 power lever was left in the IDLE position. The crew did not think an overtorque condition had occurred and continued to fly the mission for another 2.5 hours. After landing, the electronic control unit (ECU) was removed for download. As a precautionary measure, the main transmission, #2 drive shaft, drive shaft coupling, nose gearbox, and tail rotor fork assembly will be replaced.

D Model

■ **Class B:** During a 30mm gun engagement, a round struck a buried weapons cache, resulting in an explosion under the aircraft. No other details were provided.

■ **Class B:** Prior to aircraft taxi and with the APU turned off, engine power turbine speed (N_p) and main rotor speed (N_r) were observed at 101 percent. The crew heard a loud banging noise and discovered the #2 engine N_p was in the yellow at 106 percent. The crew conducted an emergency shutdown of #2 engine and followed with a normal shutdown of the #1 engine. The engine was bore-scoped and sent for teardown analysis to determine if an internal failure occurred.

CH-47

D Model

■ **Class C:** Aircraft was Chalk 2 of a flight of two under night vision goggles (NVGs) conducting a formation landing in a known dust environment during an air gunnery range. The aircraft landed with forward airspeed on a down-slope and began to slide. The underside of the nose struck a ditch, causing damage to the underside of the aircraft. The crewmembers repositioned the aircraft, performed an inspection, and returned to the airfield without further incident.

OH-58

A Model

■ **Class B:** Aircraft crashed into a gravel pit following reported engine failure and autorotation. The main rotor blades and tail boom were damaged.

■ **Class C:** Aircraft experienced an overtorque condition (115 percent) during takeoff.

DI Model

■ **Class A:** While performing a multi-ship support mission, the takeoff crew browned out during takeoff but landed safely. During the second attempt at takeoff the aircraft browned out again and crashed, resulting in major damage to the skids, fuselage, mast-mounted sight, main rotor system, and tail boom. The crew suffered minor bruises. There were no reported malfunctions prior to the accident.

DR Model

■ **Class C:** During day training, the main rotor flexed down and two blades contacted the tail rotor drive shaft cover and global positioning system (GPS) antenna. The crew was not aware of the damage and continued with the training period, which included standard autorotations, low-level autorotations, 180-degree autorotations, full authority digital electronic control (FADEC) manual throttle operations, and hydraulic operations. The damage was discovered during the post-flight inspection.

UH-60

A Model

■ **Class C:** During terrain flight on a nap-of-the-earth (NOE) route, the main rotor blades struck a tree, damaging all four tip caps.

Editor's note: **Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in a future *Flightfax* article.**

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